

# *Plumatella reticulata* Sp. Nov. In Ohio (Bryozoa: Phylactolaemata)<sup>1</sup>

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**ABSTRACT.** *Plumatella reticulata* is a new species of phylactolaemate bryozoan found in at least 13 counties in Ohio. Laboratory rearing and a re-examination of preserved specimens confirm the following features: zooids are recumbent to erect; ectocyst dark and well-sclerotized, with partial internal septa at the base of every branch; tentacles 31 to 34 ( $\bar{x}=34$ , 95% confidence interval= $\pm 2.6$ ); floatoblast broad, with extensive annulus and straight sides, valves almost equally convex; sessoblast with conspicuous pattern of dark, reticulated lines (actually blade-like ridges) across the frontal valve. Colonies have been found from June through October on wood and stone substrates in quiet water. The lophophores of young zooids exhibit a rhythmic flicking action similar to that described for *Plumatella casmiana*.

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## INTRODUCTION

The freshwater Bryozoa collected in Ohio occasionally include a form that does not match any of the currently known species. Over the past 12 years I have considered this to be a variety of *Plumatella*, similar in many respects to *Plumatella emarginata*. Now, laboratory rearing and a re-examination of preserved material show that this is a distinct species. I have named it *Plumatella reticulata* in recognition of the conspicuous, net-like pattern of dark ridges on the sessoblast.

There is a superficial resemblance between *Plumatella reticulata* and *P. emarginata*. Only these two species in Ohio have such an extensive dorsal annulus on the floatoblast, and such regularly occurring septa between zooids. Both species exhibit a conspicuous keel and furrow on the recumbent zoecia. Moreover, the two species are often so intermingled that it is difficult to distinguish their individual features.

Close inspection reveals several differences. Colonies of *Plumatella reticulata* tend to lie close to the substrate, the zoecia often fused along part of their length, giving the colony a neat, finely-textured appearance. In contrast, colonies of *P. emarginata* appear more erect, ragged and uneven, often with short, free branches. The floatoblast of *P. reticulata* is not as elongate as in *P. emarginata*, the sides are straighter, the ends more blunt, and the valves almost equally convex. Other differences include a thicker and darker ectocyst and a slightly smaller number of tentacles in *P. reticulata*. Most distinctive of all is the frontal valve of the sessoblast, which consistently has a reticulated pattern not found in any other Ohio species.

## MATERIALS AND METHODS

Colonies of *Plumatella emarginata* and *P. reticulata* were grown together in the laboratory from floatoblasts collected 18 June 1986 at Rocky Fork Lake, Highland County, Ohio. The floatoblasts were refrigerated in water from the date of collection until 10 February 1987. Rearing methods and apparatus were similar to those described by Wood (1971). Colonies were maintained at 23°C in water supplied from nearby Huffman Lake. Floatoblast valves were separated for detailed examination after immersing them for about 1 min in hot 10 M KOH solution. Colonies collected from natural populations were anaesthetized with menthol, fixed in 10% formalin, and stored in 4% formalin. Sessoblasts selected for scanning electron microscopy were dehydrated in acetone, air-dried, and then sputter-coated with gold. Confidence intervals for the means of critical measurements were calculated at the 95% level according to Student's *t* distribution (Simpson et al. 1960).

## RESULTS

Floatoblasts of both species germinated 3 d after being transferred from the refrigerator to water at room temperature. *Plumatella emarginata* colonies grew rapidly, and within 3 weeks they began producing their own floatoblasts. Growth was slower in *P. reticulata*; gametogenesis preceded floatoblast formation for the first 4 weeks, resulting eventually in more than 30 larvae. Floatoblast production began at 4 weeks and continued for 3 months until the colonies disintegrated. As early as the two-zooid stage, the ectocyst in *P. reticulata* was clearly darker than in *P. emarginata*, and this contrast became even more evident as colonies aged. The mean number of tentacles in *P. emarginata* was 38 (95% confidence interval =  $\pm 2$ ); the mean zoecium diameter was 270 ( $\pm 15$ )  $\mu$ . The corresponding values for *P. reticulata* were 34 ( $\pm 2.6$ ) and 302 ( $\pm 13$ )  $\mu$ .

Having determined that *P. reticulata* is distinct from *P. emarginata*, it is now possible to formulate a diagnosis for the species based on collections from 10 sites in Ohio.

## PLUMATELLA RETICULATA SP. NOV.

**DIAGNOSIS.** Zooids entirely recumbent in small colonies, becoming mostly upright when colonies are large and more crowded; keel and furrow distinct; ectocyst stiff, thickened, well sclerotized, and darkly pigmented; partial internal septa occurring at the base of every branch, usually at an oblique angle to the zoecium (Fig. 1a). Tentacles 25 to 41 with a mean of 34 ( $\pm 2.6$ ). Buoyant statoblasts (floatoblasts) broadly oval with long sides nearly straight and parallel, mean length to width ratio of 1.7 ( $\pm 0.1$ ); float coverage extensive especially on the dorsal valve, area of exposed capsule not exceeding 15% of dorsal side or 30% of the ventral side (Fig. 1a); dorsal fenestrum (area not covered by the annulus) clear and smooth, ventral fenestrum lightly tuberculated (Fig. 1c); valves nearly equally convex; capsule broadly oval. Attached statoblasts (sessoblasts) with a pattern of dark reticulated ridges on the frontal valve (Figs. 1d and 1e), annular lamella narrow and uniform in width. Typical plumatellid larvae bearing two polypides; overall dimensions about 650  $\mu$  long and 320  $\mu$  wide.

**HOLOTYPE.** Collected 24 June 1987 at Harsha Lake, East Fork State Park, Clermont County, Ohio; deposited at the United States National Museum, USNM 418407; the paratype, collected at the same site, is USNM 418408. Additional living and preserved specimens are available from the author.

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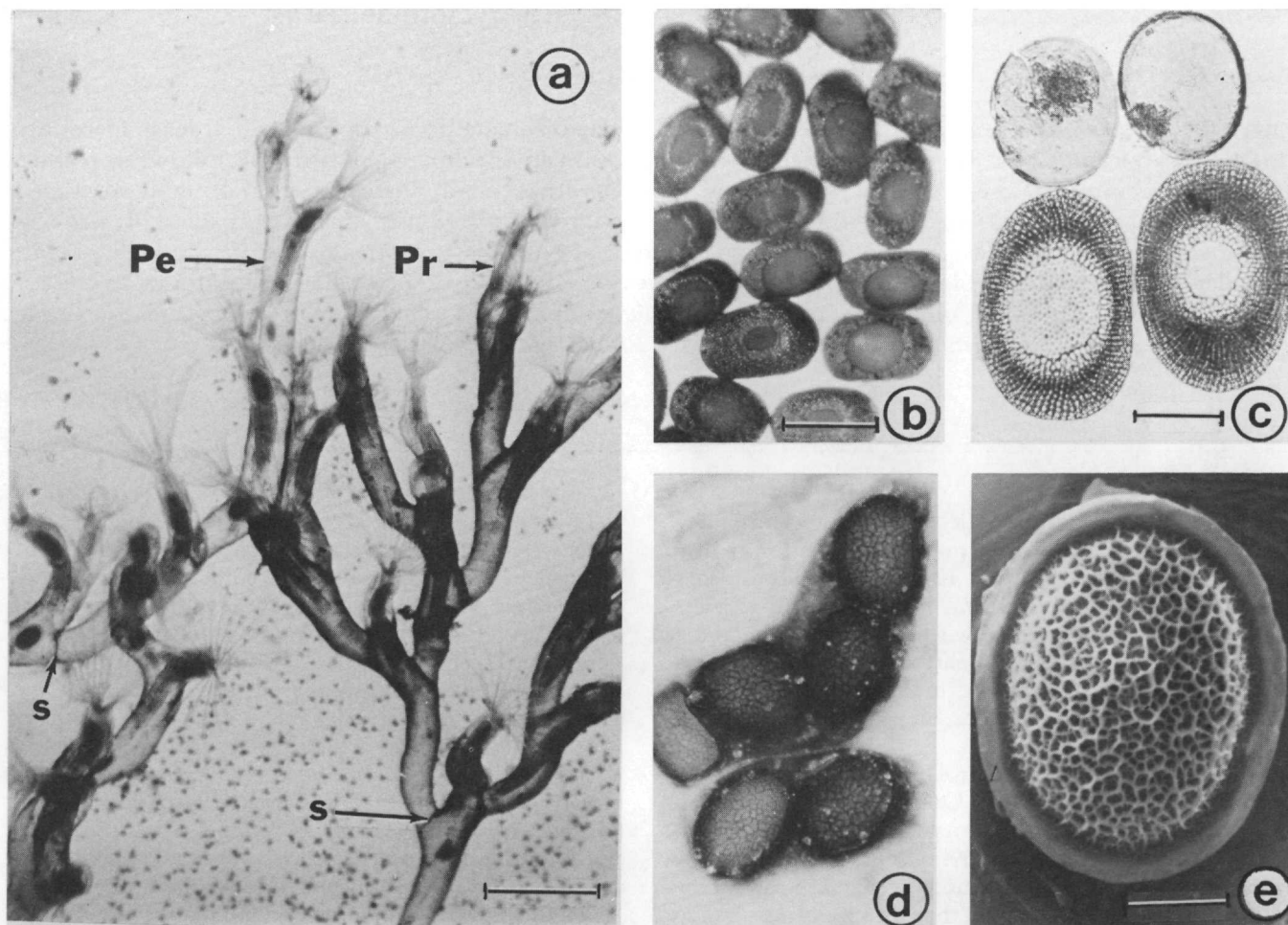


FIGURE 1a. Portions of colonies of *Plumatella emarginata* (Pe) and *Plumatella reticulata* (Pr) grown on the same dish in a laboratory aquarium from statoblasts collected together at Rocky Fork Lake, Highland County, Ohio. Both species show conspicuous septa (s) between zooids. Scale bar = 1 mm. b. Floatoblasts from *Plumatella reticulata* collected 10 July 1974 at Wills Creek Reservoir, Coshocton County, Ohio. Scale bar = 300 $\mu$ . c. Separated valves of *P. reticulata* floatoblast (periblast and capsule) from a colony collected 7 August 1975 at East Sister Island in the western basin of Lake Erie, Ontario, Canada. Scale bar = 150 $\mu$ . d. Sessoblasts from the holotype of *P. reticulata*. Scale is the same as in b. e. Scanning electron micrograph of a *P. reticulata* sessoblast taken from the laboratory-reared colony shown in a. Scale bar = 100 $\mu$ .

**ETYMOLOGY.** *reticulata* from Latin meaning network.

**DIMENSIONS.** (see Table 1).

**DISTRIBUTION.** *Plumatella reticulata* is currently known from the following widely scattered counties and sites in Ohio: Brown (Grant Lake), Clark (Clarence Brown Reservoir), Clermont (Harsha Lake), Coshocton (Wills Creek Reservoir), Greene (Huffman Reservoir), Harrison (Tappan Lake), Highland (Rocky Fork Lake), Knox (Knox Lake), Logan (Indian Lake), Miami (Decker Lake), Preble-Butler (Acton Lake), and Trumbull (Mosquito Reservoir). The species has also been found in the western basin of Lake Erie.

## DISCUSSION

Placement of this species in the genus *Plumatella* is suggested by the presence of two statoblast types: buoyant floatoblasts and attached sessoblasts. Tubular, sclerotized zooecia, dichotomous branching, and the regular arrangement of zooids are additional features which, taken together, are features characteristic of *Plumatella* species.

Considering its wide distribution and abundance in Ohio, it is odd that *Plumatella reticulata* has escaped notice for so long. Lacourt (1968) apparently saw scraps of this species in material from Lake Erie sent to him by

Rogick, but he considered it to be *Plumatella javanica*. Also, it is possible that Hastings's (1938) "Type 2" *Plumatella emarginata* is actually *P. reticulata*. Collected at Lake Huleh in what is now Israel, the unusual shape and dimensions of the floatoblasts almost exactly match those of *P. reticulata* from Ohio. Unfortunately, there were no sessoblasts in the Lake Huleh collection. Toriumi (1952) maintained that both Type 1 (typical) and Type 2 floatoblasts could be found in the same colony. However, his drawing of a Type 2 floatoblast leaves some doubt as to whether he and Hastings were actually referring to the same structures.

Because of their wide annulus, the floatoblasts of *Plumatella emarginata* and *P. reticulata* are very similar at first glance. However, the asymmetry of *P. emarginata* floatoblasts in side view is striking enough to distinguish this from any other *Plumatella* species.

*Plumatella reticulata* and *P. emarginata* are not only frequently found together, but are often difficult to separate. A colony of *P. emarginata* sometimes completely overgrows *P. reticulata*, and floatoblasts of the latter can be released into it from below. When a living colony of *Plumatella emarginata* is peeled from the substrate, sessoblasts of *P. reticulata* are occasionally found beneath it. Thus, when Bushnell (1965) noted frequent "sessoblast

TABLE 1

General dimensions in micrometers of *Plumatella reticulata* taken from a colony collected 10 July 1974 at Wills Creek Reservoir, Coshocton County, Ohio.

Measurements	Max	Min	Mean	No. measurements
Floatoblasts:				
Overall length	473	364	401 $\pm$ 6	53
Overall width	273	182	236 $\pm$ 4	53
Overall length/width	2.1	1.5	1.7 $\pm$ 0.03	53
Capsule length	309	236	271 $\pm$ 4	52
Capsule width	218	127	199 $\pm$ 4	52
Capsule length/width	2.1	1.2	1.4 $\pm$ 0.04	52
Dorsal fenestrum length	145	91	123 $\pm$ 4	51
Dorsal fenestrum width	145	55	84 $\pm$ 4	51
Dorsal fenestrum length/width	2.0	1.0	1.49 $\pm$ 0.06	51
Ventral fenestrum length	236	163	194 $\pm$ 4	52
Ventral fenestrum width	218	127	164 $\pm$ 1	52
Ventral fenestrum length/width	1.71	0.75	1.20 $\pm$ 0.04	52
Sessoblasts:				
Overall length	436	345	388 $\pm$ 13	19
Overall width	327	209	264 $\pm$ 14	19
Length/width	1.85	1.22	1.45 $\pm$ 0.08	19
Zooecium diameter	345	200	302 $\pm$ 13	22

capsule reticulations" in his Michigan collections of *P. emarginata*, he may actually have seen sessoblasts of *P. reticulata*. In Ohio, the sessoblast capsule of *P. emarginata* is mammilated but never reticulated, nor is any sessoblast reticulation mentioned in the major taxonomic studies of Toriumi (1952) or Lacourt (1968).

No single morphological feature attributed to *Plumatella reticulata* is unique to that species. Various other species have sessoblast reticulations, abundant septa, a thick and well-sclerotized ectocyst, and a relatively small number of tentacles. However, until now, these features have not been seen in combination. A striking pattern of sessoblast reticulations is described for *Internectella bulgarica* Gruncharova (1971), but the thick ridges revealed by Wiebach's (1975) scanning electron micrographs do not match the thin, bladelike structures in *Plumatella reticulata* (Fig. 1e). Also, the polypides and the unusual floatoblasts of that species bear no resemblance to those of *P. reticulata*. Reticulations on the frontal sessoblast valve are also noted in *Stephanella hina* Oka (Toriumi 1955), but here the ectocyst is described as "hyaline, thick and . . . jelly-like." *Plumatella javanica* has a network of fine lines across the sessoblast (Annandale 1910), and Lacourt has broadened the characterization of this species to include *P. reticulata*. However, the abundant septa and the very wide floatoblast annulus in the latter species are clearly distinguishing features.

A darkly pigmented ectocyst was mentioned in the original descriptions of several species, including *Plumatella emarginata* (Allman 1856) and *P. bombayensis* (Annandale 1910), now considered synonymous with *P. tanganyikae* (Annandale 1911). However, the latter species is said to also have a smooth sessoblast surface, uniformly wide floatoblast annulus, and prominent annulation of the ectocyst, none of which appear in *P. reticulata*.

In general, the darkness of an ectocyst appears to be a function of its thickness, which in turn may vary with colony age, condition, and possibly other factors. In the case of *P. reticulata*, side-by-side rearing with *P. emarginata* seems to rule out environmental causes for the difference in ectocyst shading. In wild colonies of

*P. reticulata* the ectocyst is usually covered with a light-colored layer of encrusting particles, but when the colony wall is examined in cross-section the thick, dark cuticle is always evident. It seems likely that both the dark cuticle and the sessoblast ridges are linked genetically, since both apparently result from an oversecretion of chitin.

An interesting feature of *P. reticulata* is the rhythmic, flicking action of the lophophore in young zooids. The tentacles move stiffly and in synchrony with 120 to 150 beats per min at 23°C. The beats cease about 1 week after the zooid begins feeding. The same type of movement has been observed by Viganò (1968) in *Plumatella casmiana*. No explanation has been proposed for either the mechanism or the purpose of this behavior. However, since it is known only from two species with relatively few tentacles (and thus having a limited respiratory surface), it seems possible that the movement enhances gas exchange between the lophophore and surrounding water.

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